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Research Article

Network Health Intelligence using Monitoring Tools and Machine Learning Algorithms

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Abstract

Computer networks form the basic building block of Computer networks form the basic building block of any organization's IT infrastructure. As businesses depending mostly on Internet based applications, it is very crucial that the end users remain functioning in spite of network related issues. Monitoring and improved network performance is high priority to keep businesses running with high availability. This assures service level agreements (SLA) maintained and provide reliable solutions to complex business problems. Network is error prone and affects overall business performance. Therefore to maintain reliability and availability of business critical applications proactive monitoring and actions based on the monitoring have uttermost importance. Proactive monitoring identifies the issues and trigger the corrective actions before it actually experience by the users. Network Monitoring is the one part of our proposed solution where already many Open source tools like Nagios and Zabbix can be part of solution. Second part of proposed solution is relying on data collection by network monitoring tools build the analytical based solution, which can be predict the health of network component in advance. Our proposed Network health intelligence system not only efficiently collects the monitoring data but also using machine learning algorithms predict the health of network components in advance.

Keywords: *Supervised machine learning models, unsupervised machine learning models, Messaging systems, and Performance metrics*

Introduction

As Computer networks form the basic building block of any organization's IT infrastructure. As businesses depending mostly on Internet based applications, it is very crucial that the end users remain functioning in spite of network related issues. Monitoring and improved network performance is high priority to keep businesses running with high availability. This assures service level agreements (SLA) maintained and provide reliable solutions to complex business problems. Network is error prone and affects overall business performance. Therefore to maintain reliability and availability of business critical applications proactive monitoring and actions based on the monitoring have uttermost importance. Proactive monitoring identifies the issues and trigger the corrective actions before it actually experience by the users. Proactive monitoring is the one step but predictive analysis based on previous performance history of the network components provides edge.

II. LITERATURE SURVEY

Raouf Boutaba, Mohammad Ali Salahuddin, Noura Limam, Sara Ayoubi, Nashid Shahriar, Felipe Estrada Solano, Oscar Mauricio Caicedo Rendon: A comprehensive survey on machine learning for networking evolution, applications and research opportunities. In this paper authors provides the survey on application of ML techniques in variety of network areas and network technologies. It provides comprehensive analysis of Machine learning application to basic issues in the networking like traffic prediction, traffic routing, and fault management and network security.

Rafiullah Khan, Sarmad Ullah Khan, Rifaqat Zaheer, and Muhammad Inayatullah Babar: An Efficient Network Monitoring and Management System This paper discussed the continuous and automated way to monitor the network components i.e. Network switches. It provides the scope for triggering mechanisms like SMS, EMAIL to the network administrator. It also proposes automated way of ticket creation and assignment.

Kwang-Bon Jung,Mi-Jung Choi,Myung-Sup Kim,Young-J. Won,James W. Hong: Traffic Classification Using Machine Learning Algorithms in Practical Network Monitoring Environments. As per this paper the network traffic classification went through evolution

from payload/port based to machine learning based. This paper analyzes the classification results from cross validation with split validation. This paper also discussed the classification results depends on flow to those depends on bytes. Authors provides the comparitive report of different machine learning algorithms like J48, REPTree, RBFNetwork, Multilayer perceptron, BayesNet, and NaiveBayes. In this paper, Author identifies the best feature sets and the best ML algorithm for network traffic classification using the split validation.

Mowei Wang, Yong Cui, Xin Wang, Shihan Xiao, and Junchen Jiang:Machine Learning for Networki *B. Algorithm*

Steps:
Step 1: Formulate the problem in data domain

Step 2: Collect the data like traffic traces and performance logs.

Step 3: Preprocessing the data

Step 4: Construct the data model based on size of datasets i.e.
Decision tree

Step 4:Decision tree:

a: Select the best Parameter.

b: Query with relevant context

c:Go with the answer path

d:Go to step 1 till answer arrives

Step 5: Validate the model after deployment

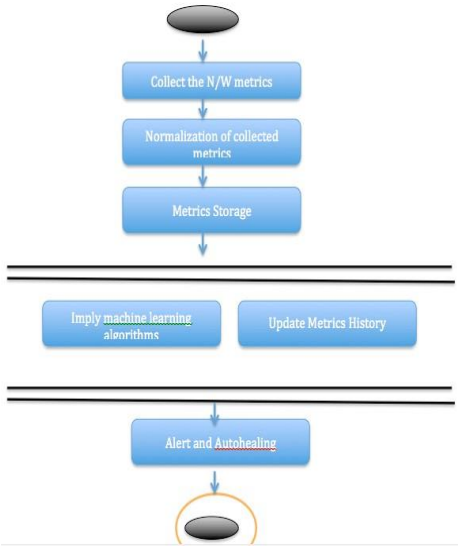

Fig. 2. System Flow

Workflow, Advances and Opportunities. This paper discussed the basic overflow of the application of machine learning algorithms in the networking domain. Authors provides board search guideline on networking with machine learning.

Deepak Chahal, Latika Kharb, Deepanshu Choudhary: Performance Analytics of Network Monitoring Tools. Network is the backbone of organization's infrastructure and maintaining its availability and reliability is always the challenge. In this paper authors discussed some popular network monitoring tools like Nagios, Zabbix and ganglia and provides the comparison report of different network monitoring tools based on the parameters like license, access control and distributed monitoring.

Saac Sikubwabo, Mariam Usanase, Dr. Papias Niyigena:Comparative Study on Network Monitoring Tools of Nagios Versus Hyperic .Author provides the comparison between two well known network monitoring tools Nagios
and Hyperic

III. PROPOSED METHODOLOGY
Network components performance metrics collection using network monitoring tool and identification, Implementation of supervised and unsupervised machine learning modals is the overall scope of project. Although scope is not limited to application of existing machine learning algorithms but improvement in existing machine learning techniques/algorithms with developing new interfaces to available network monitoring tools also the part of scope.

A. Architecture

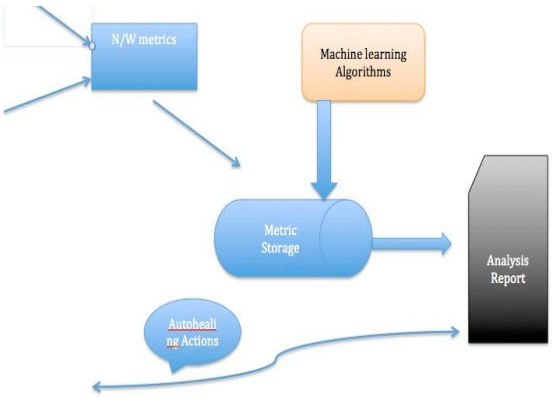

Fig. 1. Proposed System Architecture

Results and Discussion

This section discusses about observations about fault detection in the networking components after including machine-learning algorithm. Overall early detection accurate to 40-50% and it shows overall improvement in fault detection and issue resolution

time. Prior to proposed system everything relies on identification and triggering of monitoring tools without early prediction.

	Existing System based on monitoring tools (Issue resolution time after trigger)	Proposed System based on monitoring tools with early prediction with ML techniques (Decreased Issue resolution time due to early prediction)
Network component reachability i.e. using Ping test	60 sec	30 sec
Cpu usage >90 % than add a new server	120 sec	80 Sec
RAM usage>80% than add a new server	120 sec	80 sec

Conclusion

Network comprises of different complex components and become more error prone with addition of each new component. Overall it is required of early detection of network errors and necessary actions to remove the errors before it become visible to the users. Proactive monitoring is the one step but predictive analysis based on previous performance history of the network components provides edge.

Network components performance metrics collection using network monitoring tool and identification, Implementation of supervised and unsupervised machine learning modals is the overall scope of project. Although scope is not limited to application of existing machine learning algorithms but enhancement of machine learning algorithms with developing new interfaces to available network monitoring tools also the part of scope. Storage strategy to store performance metrics collected by network monitoring tool is essential part of overall scope e.g. Cluster formation/Big data setup.

References

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